PROCEEDINGS OF THE CALIFORNIA ACADEMY OF SCIENCES

Volume 53, No. 11, pp. 151–160, 2 figs. August 22, 2002

First records of snailfishes (Pisces: Liparidae) from the Galapagos Islands, with descriptions of two new species, *Paraliparis darwini* and *Paraliparis galapagosensis*

by

David L. Stein
NOAA/OAR R/OSS3
1315 East West Highway, Rm. 11805
Silver Spring, Maryland 20910
email: david.stein@noaa.gov

and

Natalia V. Chernova
Zoological Institute
Russian Academy of Sciences
199034 St. Petersburg, Russia
email: antarct@zin.ru

Snailfishes (Family Liparidae, Order Scorpaeniformes) are very widely distributed both in depth and geographically; more than 130 species are known from the Southern Hemisphere, and five species from deep, eastern Pacific, equatorial waters. We report herein the first record of the family from the Galapagos Islands, and describe two new species, *Paraliparis darwini* and *P. galapagosensis*.

Liparid fishes are distributed worldwide in cold and cool waters at depths from the intertidal to over 7000 m. They are highly speciose and morphologically diverse, occupying a wide variety of habitats including benthic, epibenthic, and pelagic zones. In the Southern Hemisphere, there are at least 130 described species (Andriashev 1986; Stein and Tompkins 1989; Stein and Andriashev 1990; Stein, Melendez, and Kong 1991; Andriashev and Stein 1998; Stein, Chernova, and Andriashev 2001; Chernova and Stein in press; and others) from the Antarctic, Australia, Chile, Argentina, and other locations. In the tropical and subtropical Pacific, the five known species are from great depths (*Careproctus longifilis* Garman 1892, SW of Panama, 3343 m; *Paraliparis fimbriatus* Garman 1892, SW of Panama, 3241 m; *P. latifrons* Garman 1899, Panama Bay, 3279 m; *P. angustifrons* Garman 1899, Panama Bay, 935 m; *P. attenuatus* Garman 1899, Panama Bay, 1650 m). No species were previously known from the Galapagos Islands (Grove and Lavenberg 1997).

In this paper, we report the first records of the family from the Galapagos, and describe *Paraliparis darwini* and *Paraliparis galapagosensis*, two new species from upper slope depths. Both specimens were collected by the Johnson Sea-Link, a three-person research submersible especially well suited for collecting specimens in topographically complex environments where trawl nets are unusable.

Methods

We follow previously published methods of Andriashev and Stein (1998) and Stein et al. (2001) for counts, measurements, and abbreviations for describing liparids. Proportions are given as % SL (% HL in parentheses). Terminology of mouth and lower jaw follow Stein et al. (2001). Counts were obtained using radiographs. Pectoral girdles were removed and then cleared and stained with Alizarin Red S by the method of Andriashev, Neyelov, and Prirodina (1977).

The following abbreviations for counts and measurements have been used:

For counts

V: vertebrae (abdominal + caudal)
D: dorsal-fin rays
A: anal-fin rays
C: caudal-fin rays
P: pectoral-fin rays (upper lobe rays + notch rays + lower lobe rays)
gr: gill rakers
pc: pyloric caeca
Rad: radials of pectoral girdle

For sensory pores:

io: infraorbital
n: nasal
pm: preoperculo-mandibular
t: temporal

For measurements:

aAf: distance from center of anus to anal-fin origin
bd: maximum body depth
bdA: body depth at anal fin-origin
E: horizontal diameter of eye
go: length of gill opening
HD: maximum head depth
HL: head length
HW: head width
io: interorbital width (between upper margins of eyes)
lj: lower jaw length
LPL: greatest length of lower lobe of pectoral fin
ma: length from mandibular symphysis to center of anus
NL: length of shortest notch ray of pectoral fin
po: postocular head length
preA: preanal-fin length
preD: predorsal-fin length
sn: snout length; tip of snout to anterior margin of eye
SL: standard length
uj: upper jaw length
UPL: greatest length of upper lobe of pectoral fin

Collection abbreviations follow Leviton et al. (1985). Figures are by the junior author. Pectoral girdle preparations are deposited with the specimens.

TAXONOMIC DESCRIPTIONS

Genus *Paraliparis* Collett, 1878

Paraliparis Collett, 1878:34 (type species *Paraliparis bathybii* Collett, 1878 by monotypy). Burke, 1930:154; Andriashev, 1954:464; Cohen, 1968:385; Stein, 1978a:5, 1978b:37; Andriashev, 1986:14; Stein, Chernova, and Andriashev, 2001:360.

DIAGNOSIS. — One pair of nostrils (nostrils single). Ventral sucking disk absent. A single terminal (sensu Andriashev, 1986) or suprabranchial (sensu Burke, 1930) pore present in temporal canal. Pectoral fin divided into two lobes or not; if present, lower lobe not forming a single filament. Pseudobranch absent. Coronal pore absent. Barbels or skin flaps on head absent.

***Paraliparis darwini* n. sp.**
Figure 1

DIAGNOSIS. — A *Paraliparis* with teeth in upper jaw absent, in lower jaw uniserial except very close to symphysis. Teeth in lower jaw blunt canines, oval in cross-section. Chin gelatinous, chin-pore pair on anterior rather than ventral surface. Head length 21.8% SL, its width 65%, and depth 84%, its length. Upper jaw 44% HL. Body depth at anal-fin origin 22.1 (102). Lower pectoral-fin lobe 65% length of upper lobe. P 23 (15+2+6), V 66, C 8. Rad 4 (3+1), round.

HOLOTYPE. — CAS 86576. Female, 131 mm SL, 149 mm TL. "Johnson Sea-Link" Dive 3971, NE Pacific, Isla Wolf, Galapagos Islands, Ecuador, 637 m, suction collector, 23 November 1995. Coll. J. E. McCosker et al.

COUNTS AND MEASUREMENTS. — V 66 (12+54), D 58, A 53, P 23 (15+2+6), C 8 (4/4), gr 12, pc 10. HL 21.8, HW 14.1 (65), HD 18.3 (84.2), sn 8.4 (38.6), E 3.8 (17.5), po 11.5 (52.6), io 8.5 (39.3), go 3.8 (17.5), uj 9.5 (43.9), lj 8.5 (39.3), preD 33.5, preA 40, ma 15.6, aAf 22.9, bd 26 (119), bdA 22.1 (102), UPL 15.3 (70), NL 5.3 or 35% UPL, LPL 10.7 or 70% UPL.

DESCRIPTION. — Head deep at occiput, not compressed, its width 1.3 in its depth. Anterodorsal contour of head sloping at angle of about 45°, slightly concave above eye. Snout large, deep, rounded, gelatinous, slightly projecting beyond upper jaw, its length 2.2 times eye diameter. Subrostral fold deep, well developed, covering upper lip entirely. Nostril with raised rim, not large, horizontal with lower margin of eye. Eye longitudinally oval, moderately large, not touching dorsal contour of head. Interorbital 2.2 times eye. Mouth subterminal and small, oral cleft reaching to below anterior margin of pupil, posterior end of maxilla (under thick soft skin cover) below posterior third quarter of eye. Lower jaw subterminal. Chin gelatinous, anterior margin prominent beyond lower jaw, chin pores on its anterior rather than ventral surface. Teeth on upper jaw absent. Teeth on lower jaw primarily uniserial; in 3 short oblique rows (about 3, 4 and 6 teeth) at symphysis, but posteriorly forming a single long row of no fewer than 25 teeth on right side of jaw. Teeth small canines, not sharp, not touching each other; in the uniserial row posterior teeth slightly larger than anterior; in dorsal view (e.g., cross-section) teeth oval. Sensory pores less than nostril in diameter; pores on snout with thickened margins (contoured), in comparatively deep pits of soft tissue and thus look similar to nostril in diameter. Pores 2-6-7-1, postorbital pore present. Chin pores not closely set, interspace about equal to distance pm_1-pm_2, each in a shallow pit of soft tissue. Gill opening small, equal to horizontal diameter of eye, entirely above pectoral-fin base. Gill opening located relatively high on side of body, its dorsal end horizontal with upper margin of eye. Opercular flap small, triangular, its rounded tip closer to lower end of gill opening and level with upper margin of eye.

Pectoral fin notched, notch rays 2. Uppermost pectoral ray horizontal with upper margin of eye. Upper lobe not reaching anal-fin origin. Dorsalmost (6th) lower lobe ray longest, lowermost pectoral ray inserted below anterior third of postocular space. Coracoid not projecting from ventral contour of

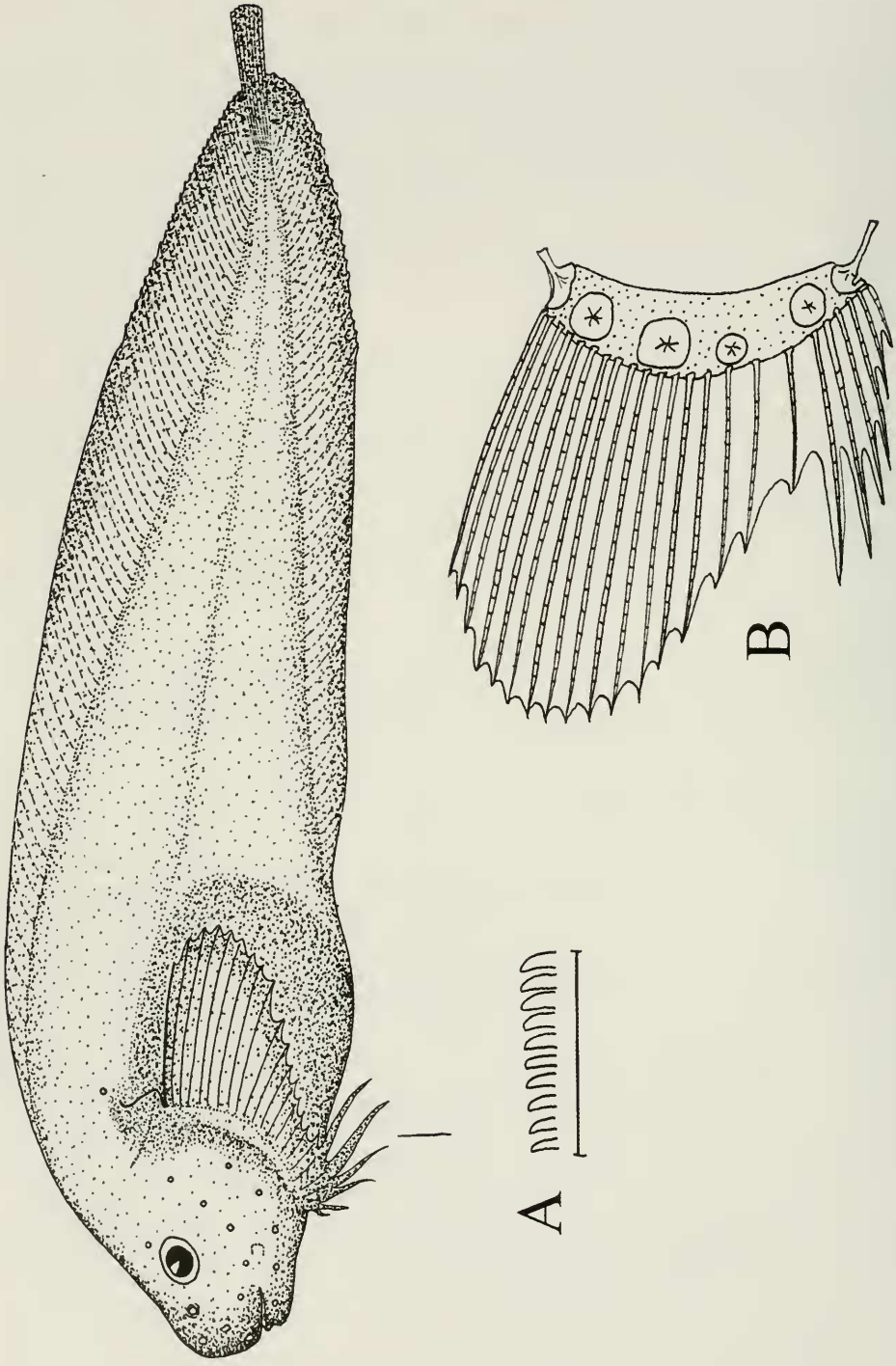

FIGURE 1. *Paraliparis darwini* n. sp. Holotype, CAS 86576, from off Isla Wolf, Galapagos Islands, Ecuador, in 637 m. A: Lower jaw teeth, right lateral view. Scale 1 mm. B: Pectoral-fin structure.

body. Lower pectoral-fin lobe length 65% that of upper lobe. Right and left lower pectoral-fin lobes not touching. A transverse, thick, pocket-shaped skin fold present on isthmus anterior to lower lobes. Radials 3+1, round or rounded, unnotched, R3 distinctly smaller than others. Scapula with slender helve of moderate length, coracoid with very slender, long helve, base notched ventrally.

Body hump-backed, deep (depth at anal-fin origin about equal to head length). Anus below third quarter of postocular space. Anus and small genital papilla in a shallow pit, surrounded by soft radial skin folds. Dorsal contour of body widely rounded. Maximum depth at dorsal-fin origin. Two free interneurals present between neural spines 4, 5, and 6. First dorsal ray between neural spines 6 and 7. Dorsal and anal fins not deep: at mid-length of caudal part of body, fin depth less than body depth. In posterior third of caudal part of body, dorsal fin slightly deeper than anal fin. Dorsal and anal fins overlap about half of caudal fin. Gelatinous tissue moderately developed; thicker on snout and chin. Skin thin, semitransparent, covered with thick mucous layer, opaque after fixation. Free neuromasts not found. Pyloric caeca digitate, tips sharp, longest ca. 5.3% SL. Ovarian eggs unripe, less than 0.5 mm in diameter.

In alcohol, body color pale, yellowish brown. Margins of dorsal and anal fins, caudal and pectoral fins blackish. Ventrally, snout and head, inner subrostral fold, lips and gill opening rosy brown. Mouth and gill cavities dusky gray. Gill arches pale. Peritoneum ink-black. Stomach, pyloric caeca, and intestine pale.

DISTRIBUTION. — Known only from the holotype, collected off Isla Wolf, Galapagos Islands. The specimen was collected from a gently sloping, sand bottom using rotenone and a suction collector. Also collected during the same dive were *Chauliodus* sp., *Stylephorus chordatus*, *Symphurus diabolicus*, and some invertebrates.

ETYMOLOGY. — Named after Charles Darwin, describer of the biological diversity of the Galapagos Island fauna and its significance.

COMPARISONS. — The new species is most similar in counts to *P. galapagosensis* (below) but differs most significantly in number of gill rakers (12 vs. 8). Its general aspect is quite different, having a much less rounded and longer head and longer abdominal cavity. Specifically, it differs proportionally from *P. galapagosensis* in head shape (anterodorsal contour at 45°, snout projecting vs. head evenly rounded, snout not projecting), head depth (84.2 vs. 100% HL), snout length (39 vs. 34% HL), upper jaw length (43.9 vs. 36.8% HL), and body depth at anus (102 vs. 75% HL). It is also similar to *P. merodontus* Stein, Melendez and Kong 1991 from Chile, but differs most distinctly in the number of vertebrae (66 vs. 62–64), radials (3+1 vs. 3+0), and pyloric caeca (10 vs. 6–8). Proportionally it differs most in longer head (21.8 vs. 15.1–17.2) and snout (8.4 vs. 4.4–5.7), greater predorsal-fin length (33.5 vs. 19.3–26.9), preanal-fin length (40 vs. 34.5–37.6), and body depth (26 vs. 17.3–20.2).

***Paraliparis galapagosensis* n. sp.**
Figure 2

DIAGNOSIS. — A *Paraliparis* with upper jaw dentition limited to 3–4 isolated teeth on each side of symphysis; lower jaw teeth uniserial except very close to symphysis, recurved anteriorly, tips overlapping to form a sharp cutting edge. Chin not gelatinous, chin pore pair on ventral surface of chin. HL 20.7% SL, its depth equal to its length. Upper jaw 37% HL. Body depth at anal-fin origin 15.4 (75). Lower pectoral-fin lobe equal to length of upper lobe. P 22 (15+1+6), V 67, C 8. Rad 4 (3+1), round.

HOLOTYPE. — CAS 86737. Female, 94 mm SL, 104 mm TL. "Johnson Sea-Link" Dive 3949, Cabo Rosa, S of Isla Isabela, Galapagos Islands, Ecuador, 710 m, suction collector, 11 November 1995. Coll. J. E. McCosker et al. Specimen compressed, head strongly flexed ventrally.

COUNTS AND MEASUREMENTS. — V 67 (12+55), D 60, A 55, P 22 (15+1+6), C 8 (4/4), gr 8, pc 9. HL 20.7% SL, HW - (-), HD 20.7 (100), sn 6.7 (33.7), E 4.1 (20.0), po 11.1 (58), io 6.7 (32.6), go 3.3 (15.8), uj 7.6 (36.8), lj 8.7 (42.1), preD 30.6 (136.1), preA 33.0 (147.2), ma 13.6 (60.4), aAf 16.3

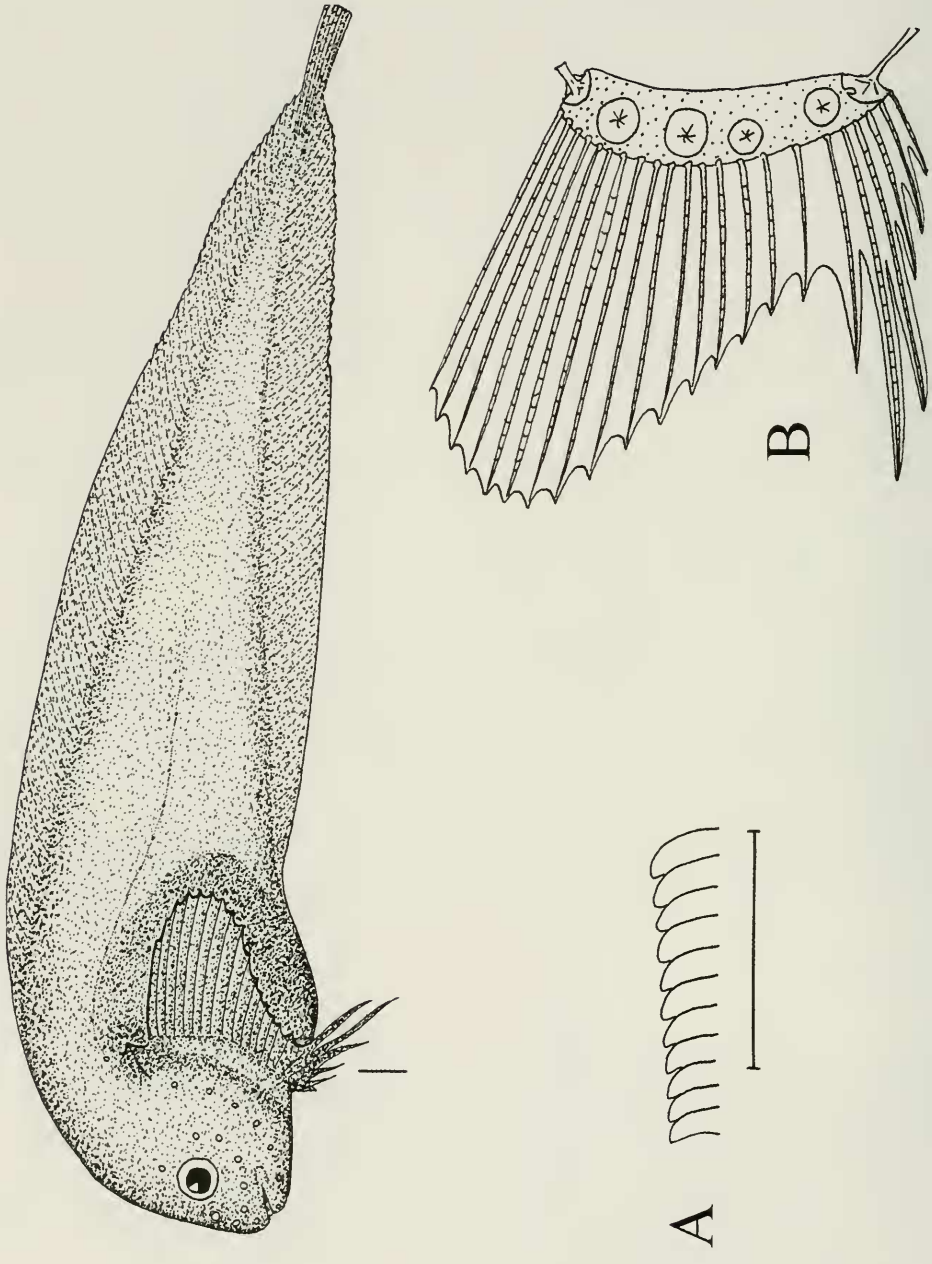

FIGURE 2. *Paraliparis galapagosensis* n. sp. Holotype, CAS 86737, from off Cabo Rosa, S of Isla Isabela, Galapagos Islands, Ecuador, in 710 m. Specimen compressed, head strongly flexed ventrally. A: Lower jaw teeth, right lateral view. Scale 1 mm. B: Pectoral-fin structure.

(72.6), bd ca. 27 (108), bdA 15.4 (74.7), UPL 13.0 (63.2), NL - (-), LPL 13.0 (63.2), LPL 100% UPL, pc 6.5 (31.2).

DESCRIPTION. — Head deep at occiput, anterodorsal contour evenly curved from occiput to above eye; from there, sloping almost vertically to tip of snout; in life, probably quite compressed. Snout shallow, rounded, not gelatinous, only slightly projecting beyond upper jaw, short, 1.7 eye diameter. Subrostral fold developed. Nostril with raised rim, not large, about on a horizontal with lower margin of eye. Eye round, not large, far below dorsal contour of head. Interorbital 1.6 eye. Mouth inferior and small, oral cleft reaching to below anterior margin of eye, posterior end of maxilla (under thick soft skin cover) below posterior ¾ of eye. Lower jaw included. Chin not gelatinous, rounded in lateral view, sloping gradually posteriorly, chin pores on its ventral surface. Teeth on upper jaw present, but only 3–4 isolated teeth on each side of the symphysis. Teeth on lower jaw uniserial except close to symphysis, forming one long row of no fewer than 40 teeth on right side of jaw. Teeth small, sharp, recurved anteriorly so that tips overlap to form a sharp cutting edge. Teeth graduated in size, becoming increasingly large posteriorly; oval in cross-section. Sensory pores smaller than nostril in diameter; pores on snout without thickened rims (not contoured), not in pits of soft tissue; similar to nostril in diameter. Pores 2-6?-7-1, postorbital pore not found owing to skin damage, probably present. Chin pores not closely set (interspace about equal to distance pm_1-pm_2), level with chin surface, not in pits. Posterior to postorbital pore, a row of about 14 free neuromasts present along midline of body. Gill opening short, 0.8 eye diameter, entirely above pectoral-fin base. Gill opening located relatively high on side of body, level of ventral end well above upper margin of eye. Opercular flap small, triangular, its tip above middle of gill opening, well above horizontal through upper margin of eye.

Pectoral fin notched, one notch ray. Uppermost pectoral ray above horizontal through upper margin of eye. Upper lobe reaching anal-fin origin. Longest lower lobe ray fifth from bottom; lowermost pectoral ray inserted below posterior third of postocular space. Lower pectoral-fin lobe length about equal to that of upper. The two lower pectoral-fin lobes not touching. Radials 3+1, R3 smallest; all round, unnotched. Scapula with slender short helve, coracoid with long, very slender helve.

Body strongly hump-backed, deepest just posterior to gill opening. Anterior of vertebral column strongly curved ventrally to parallel dorsal outline of body, probably natural. Anus below gill opening, almost between insertion of lowest pectoral-fin lobe rays. Ventral contour of body almost straight. One free dorsal interneural present, insertion of first dorsal ray between vertebrae 6/7. Dorsal and anal fins not deep: at mid-length of caudal part of body, fin depths less than body depth. In posterior third of caudal part of body, dorsal fin not deeper than anal fin. Dorsal and anal fins overlap first third of caudal fin. Gelatinous tissue absent. Skin thin, semitransparent. Pyloric caeca digitate, tips sharply pointed, longest ca. 6.5% SL.

In alcohol, body color pale, yellowish brown. Margins of dorsal and anal fins, caudal and pectoral fins blackish. Ventrally, snout and head, lips and gill opening rosy brown. Mouth and gill cavities dusky gray. Gill arches pale. Peritoneum ink black. Stomach, pyloric caeca and intestine pale.

DISTRIBUTION. — Known only from the holotype, collected off Isla Isabela, Galapagos Islands. The specimen was captured using a suction sampler above a sand bottom with no current. Also collected during the dive were *Symphurus diabolicus*, *Bathypterois* sp., *Dibranchus erinaceus*, and *Rajella eisenhardti*, and numerous shrimps and holothurians.

ETYMOLOGY. — The new species is named after the Galapagos Islands of Ecuador, the location of its collection.

COMPARISONS. — In its counts and tooth arrangement, the new species is most similar to *P. darwini* (see above for comparison) although its appearance is quite different. It is also similar to *P. merodontus* from Chile, but differs in number of vertebrae (67 vs. 62–64), anal-fin rays (55 vs. 50–52), radials (3+1 vs. 3+0), and pyloric caeca (9 vs. 6–8). Proportionally it differs most notably in its greater body depth (ca. 27% SL vs. 17.3–20.2% SL), but it also differs significantly in longer HL

(20.7 vs. 15.1–17.2) greater predorsal-fin length (30.6 vs. 19.3–26.9), and shorter distance from anus to anal-fin origin (16.3 vs. 19.4–24.4).

Discussion

Given the recent discoveries of many new snailfishes from the Southern Hemisphere (e.g., Andriashev and Stein 1998; Stein et al. 2001), the discovery of new liparid species from the Galapagos Islands extends the very broad bathymetric and geographic distribution of the family. The islands are isolated both above and below the water level (McCosker and Rosenblatt 1984; Grove and Lavenberg 1997) and thus the occurrence of species endemic to the islands, rather than occurring on the mainland, is "normal." Estimated ichthyofaunal endemism is 9.4% of the 437 species reported by Grove and Lavenberg (1997), the vast majority of which occur at less than 100 m depth, but only 23 species are known from greater depths (ibid.); we suggest that this probably reflects the lack of deep-water sampling around the islands rather than a depauperate fauna. McCosker and Rosenblatt (1984) explained the occurrence of endemic species by pointing out that most of the endemics are from families with low vagility of larvae, i.e. short larval stages without long pelagic phases. This is also true of deep-water liparids (Stein 1980). They predicted that "the deep, nearshore steep slopes . . . are likely to contain interesting surprises . . . modern submersibles . . . allow mankind to reach new depths . . ." These new species of a family previously unknown from the Galapagos fit this prediction in location and collection method.

The zoogeographic/systematic relationship between the Galapagos species and the liparid fauna of the South Pacific is unknown, although the general relationship of the islands' shallow-water fish fauna is closest to the eastern tropical Pacific mainland, with nearly 60% of species in common (McCosker and Rosenblatt 1984; Grove and Lavenberg 1997).

With respect to their tooth arrangement and general morphology, the new species seem most closely related to *P. merodontus* from Chile, which has an edentate upper jaw and uniserial lower jaw teeth, but differs in having 3+0 radials rather than 3+1. Tooth arrangement in both new species seems to place them in the *Paraliparis copei* group (see Andriashev 1986, Stein and Andriashev 1990, and Stein et al. 1991), which is nominally based on all members having teeth uniserial in at least one jaw, very short or porelike gill opening with reduced opercular flap, and 3 (3+0) pectoral radials. However, in their pectoral structure and somewhat larger gill opening both differ from *P. copei* and its subspecies (*P. copei gibbericeps* Andriashev 1982a, *P. copei kerguelensis* Andriashev 1982b, and *P. copei wilsoni* Richards 1966).

There has been no phylogenetic analysis of the relationships of this group (*P. copei copei* Goode and Bean 1896, *P. copei gibbericeps*, *P. copei kerguelensis*, *P. copei wilsoni, P. merodontus, P. nassarum* Stein and Fitch 1984, *P. neelovi* Andriashev 1982b, *P. paucidens* Stein 1978b, *P. rosaceus* Gilbert 1890) or thorough examination of their comparative morphology, and indeed, their identity as a group is somewhat questionable. Pectoral girdle structure is unknown for *P. nassarum, P. paucidens*, and *P. rosaceus*, and as described above, *P. darwini* and *P. galapagosensis* differ at least in their pectoral girdle morphology. These differences suggest that either tooth pattern or pectoral girdle structure is not a good indicator of relationship. Resolution of this question awaits a full analysis.

Acknowledgments

The senior author was partially supported by the Office of Oceanic and Atmospheric Research, National Oceanic and Atmospheric Administration. The junior author was supported by the Russian Science Foundation, Grants No 99-04-49774, 96-15-97881 and FGP "World Ocean" Project 16. We thank J. McCosker for bringing the specimens to our attention and for providing his detailed field collection notes.

LITERATURE CITED

ANDRIASHEV, A. P. 1954. Fishes of the northern seas of the U. S. S. R. Fauna of the USSR 53. Izdatel'stvo Akad. Nauk SSSR Moscow [In Russian]. Fishes of the northern seas of the U.S S.R. Translated 1964. Israel Prog. Sci. Transl. 836:1–617.

———. 1982a. New species of the genus *Paraliparis* (Liparidae) from the western Antarctic. Report 2. Vopr. Ikhtiol. 22(2):179–186. [In Russian]

———. 1982b. A review of fishes of the genus *Paraliparis* Collett (Liparidae) from the Kerguelen area, Subantarctic. Zool. Zh. 61(5):716–725

———. 1986. Review of the snailfish genus *Paraliparis* (Scorpaeniformes: Liparididae) of the Southern Ocean. Theses Zoologicae 7, Koeltz Scientific Books, Koenigstein. 204 pp.

ANDRIASHEV, A. P. AND D. L. STEIN. 1998. Review of the snailfish genus *Careproctus* (Liparidae, Scorpaeniformes) in Antarctic and adjacent waters. Contr. Sci., Nat. Hist. Mus. L. A. County 470:1–63.

ANDRIASHEV, A. P., A. V. NEYELOV, AND V. P. PRIRODINA. 1977. On the method of studying the morphology and systematics of snailfishes (Liparidae). Zool. Zh. 56 (1):141–147. [In Russian, with English summary]

BURKE, C. V. 1930. Revision of the fishes of the family Liparidae. Bull. U. S. Nat. Mus. 150:1–204.

CHERNOVA, N. V. AND D. L. STEIN. In Press. Ten new species of *Psednos* (Pisces, Scorpaeniformes: Liparidae) from the Pacific and North Atlantic Oceans. Copeia.

COHEN, D. M. 1968. The cyclopterid genus *Paraliparis*, a senior synonym of *Gymnolycodes* and *Eutelichthys*, with the description of a new species from the Gulf of Mexico. Copeia 1968(2):384–388.

COLLETT, R. 1878. Fiske fra Nordhavs-expeditionens sidste togt, sommeren 1878. Forhandl. Vidensk.-selsk. Christiania 1878 14:1–106.

GARMAN, S. 1892. The Discoboli. Cyclopteridae, Liparopsidae, and Liparididae. Mem. Mus. Comp. Zool. 14 (pt. 2):1–96.

———. 1899. The Fishes. *In* Reports on an exploration off the west coasts of Mexico, Central and South America, and off the Galapagos Islands . . . by the U. S. Fish Commission Steamer "Albatross" during 1891 . . . . No. XXVI. Mem. Mus. Comp. Zool. 24:1–431, Atlas Pls. 1–85 + A–M.

GILBERT, C. H. 1890. A preliminary report on the fishes collected by the steamer *Albatross* on the Pacific coast of North America during the year 1889, with descriptions of twelve new genera and ninety-two new species. Proc. U. S. Nat. Mus. 13:49–126.

GOODE, G. B. AND T. H. BEAN. 1896. Oceanic Ichthyology, a treatise on the deep-sea and pelagic fishes of the world. Spec. Bull. U. S. Nat. Mus. (1895):xxxv + 553 pp., with atlas.

GROVE, J. S. AND R. J. LAVENBERG. 1997. The fishes of the Galapagos Islands. Stanford University Press, Stanford. 863 pp.

LEVITON, A. E., R. H. GIBBS, JR., E. HEAL, AND C. E. DAWSON. 1985. Standards in herpetology and ichthyology. Part I. Standard symbolic codes for institutional resource collections in herpetology and ichthyology. Copeia 1985(4):802–832.

MCCOSKER, J. E. AND R. H. ROSENBLATT. 1984. The inshore fish fauna of the Galapagos Islands. Ch. 9 *in* Key Environments: Galapagos, R. Perry, ed. Pergamon Press, Oxford. 321 pp.

RICHARDS, W. J. 1966. *Paraliparis wilsoni*, a new liparid fish from the Gulf of Guinea. Proc. Biol. Soc. Wash. 79:171–174.

STEIN, D. L. 1978a. The genus *Psednos* a junior synonym of *Paraliparis*, with a redescription of *Paraliparis micrurus* (Barnard) (Scorpaeniformes: Liparidae). Matsya 4:5–10.

———. 1978b. A review of the deepwater Liparidae (Pisces) from the coast of Oregon and adjacent waters. Occ. Pap. Calif. Acad. Sci. 127:1–55.

———. 1980. Aspects of reproduction of liparid fishes from the continental slope and abyssal plain off Oregon, with notes on growth. Copeia 1980(4):687–699.

STEIN, D. L. AND A. P. ANDRIASHEV. 1990. Family Liparididae. Pp. 231–255 *in* Fishes of the Southern Ocean, O. Gon and P. C. Heemstra, eds. J. L. B. Smith Inst. Ichthyol., Grahamstown. 462 pp., 12 pl.

STEIN, D. L. AND J. E. FITCH. 1984. *Paraliparis nassarum* n. sp. (Pisces, Liparididae) from off southern California with descriptions of its otoliths and others from north-east Pacific liparidids. Bull. So. Calif. Acad. Sci. 83(2):76–83.

STEIN, D. L. AND L. S. TOMPKINS. 1989. New species and new records of rare Antarctic *Paraliparis* fishes (Scorpaeniformes: Liparididae). Ichthyol. Bull. J. L. B. Smith Inst. Ichthyol. 53:1–8.

Stein, D. L., N. V. Chernova, and A. P. Andriashev. 2001. Snailfishes (Pisces:Liparidae) of Australia, including descriptions of 30 new species. Rec. Austr. Mus. 53:341–406.

Stein, D. L., R. Melendez C., and I. Kong U. 1991. A review of Chilean snailfishes (Liparididae, Scorpaeniformes) with descriptions of a new genus and three new species. Copeia 1991(2):358–373.